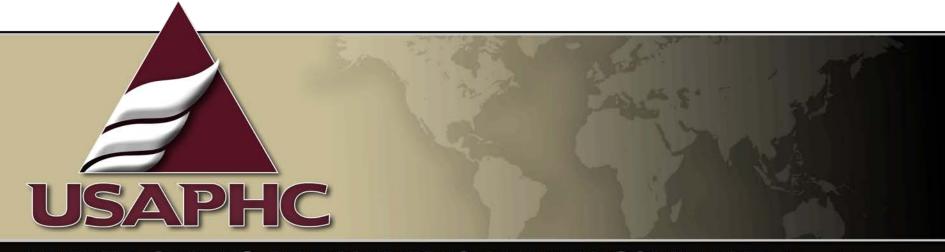
Characterizing Munitions Constituents from Artillery and Small Arms Ranges



UNITED STATES ARMY PUBLIC HEALTH COMMAND (Provisional)

Institute of Public Health
Surface Water and Wastewater Program
E2S2 Conference 9-12 May 2011

| maintaining the data needed, and c including suggestions for reducing | lection of information is estimated to ompleting and reviewing the collect this burden, to Washington Headqu uld be aware that notwithstanding an DMB control number. | ion of information. Send comments arters Services, Directorate for Info | s regarding this burden estimate or ormation Operations and Reports | or any other aspect of the 1215 Jefferson Davis | his collection of information, Highway, Suite 1204, Arlington | |
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Report Documentation Page

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Background

- Conducted assessments of Army training and testing ranges in U.S.
 - Determined if munitions constituents of concern (MCOC) are elevated at range boundaries
 - Assessed potential impact of elevated MCOC on ecological or human receptors off-range
- 13 installations
 - 24 small arms sample locations
 - 48 impact area sample locations





Predicted MCOC

Artillery Impact Areas

- Explosives
 - RDX
 - TNT
 - 2, 4-DNT,
 - 2,6-DNT
- Perchlorate
- Metals

Small Arms Ranges

- Metals
 - Copper (Cu)
 - Lead (Pb)
 - Zinc (Zn)
 - Antimony (Sb)





MCOC Sampling Process

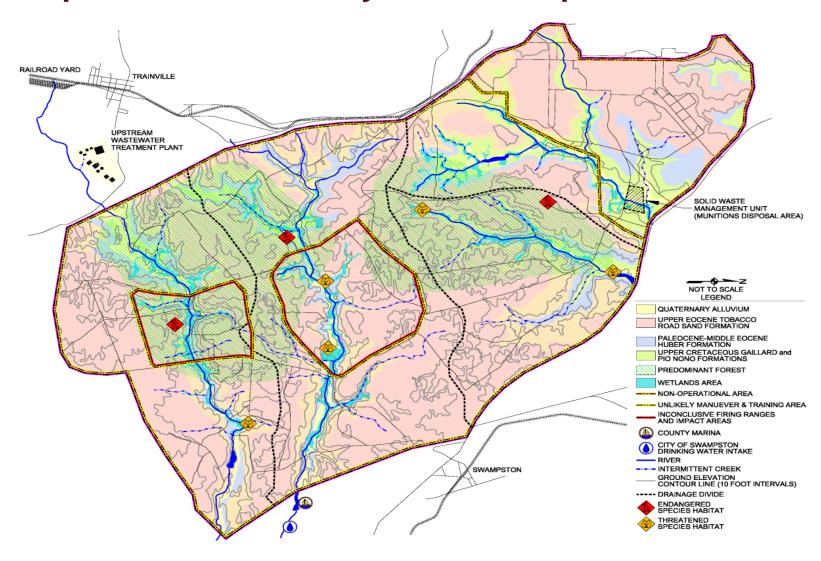
- 1st -determine if sampling necessary
 - MCOC source
 - Pathway(surface water system)
 - Receptor
- 2nd sample to measure MCOC at range boundary and reference (background)







Example Surface Water System Conceptual Site Model







Sample Collection Strategy

- Surface water drainage pathways
 - Upstream/downstream of ranges
 - Wet/dry seasons
 - Clear /storm conditions
 - Composite or grab sample
- Both surface water and sediment collected







Data Results

- Compare data averages statistically
 - Upstream (background)
 - Downstream (range boundary)
- Types of MCOC found above background:
 - Explosives: RDX
 - Metals: Sb, Cu, Pb, Zn





Data Evaluation Method

- Screening value (SV) chosen
 - Department of Defense Range and Munitions Use Subcommittee Workgroup (RMUS)
 - EPA and State standards
- 95% upper confidence level of the mean compared to SLs
- Determine if potential risk





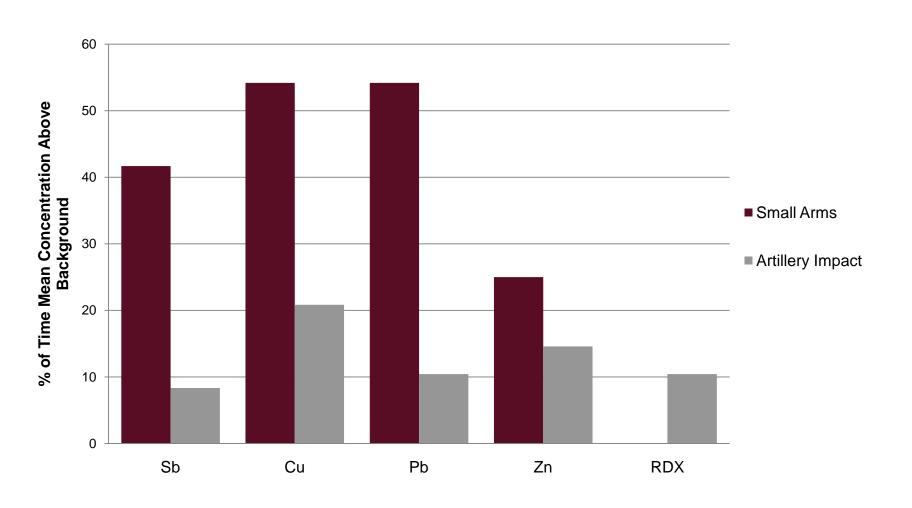
Range of Ecological and Human SVs Used in the Analysis

| | Human | Ecological | | |
|------|---------------------|----------------|-------------------|--|
| MCOC | Potable Water (ppb) | Water (ppb) | Sediment (ppm) | |
| Sb | 14 - 15 | 5.6 - 160 | 2 - 12 | |
| Cu | 1300 - 1500 | 0.9 - 24 | 16 - 34 | |
| Pb | 15 | 0.08 – 13 | 31 - 47 | |
| Zn | 9100 - 11000 | 7.8 - 304 | 120 - 150 | |
| RDX | 0.61 - 2 | 190 | 0.013 | |





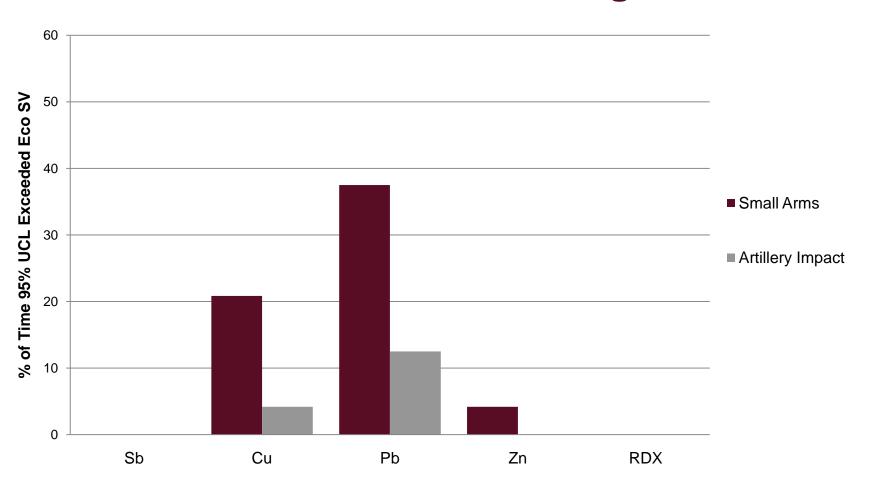
Surface Water Mean Downstream Concentrations Above Background Concentrations







Surface Water 95% UCL of Mean Downstream Concentrations Exceed Ecological SVs







Summary – Surface Water

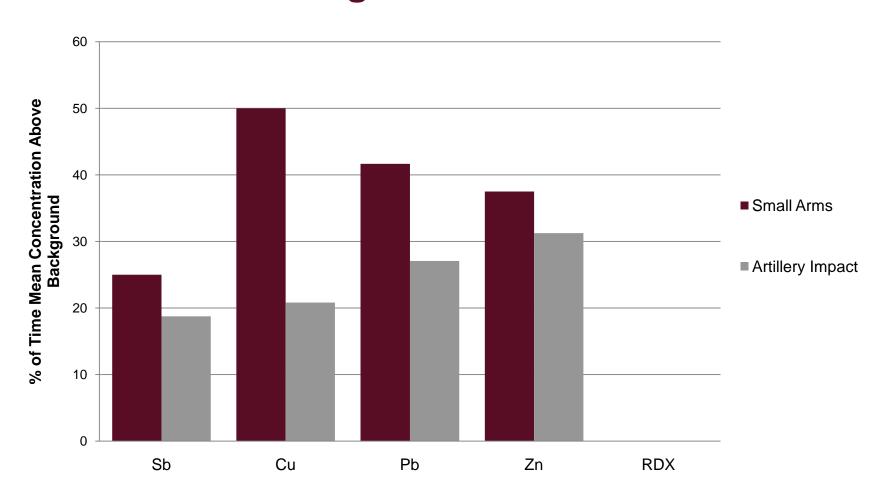


- Human SV exceedances
 - Pb small arms range
- Ecological SV exceedances
 - Cu and Pb both range types
 - Zn small arms





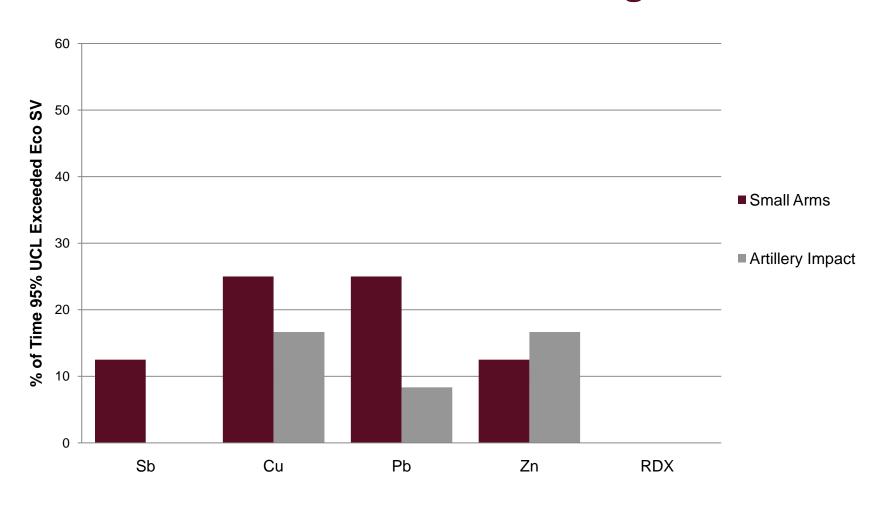
Sediment Mean Downstream Concentrations Above Background Concentrations







Sediment 95% UCL of Mean Downstream Concentrations Exceed Ecological SVs







Summary – Sediment

- Pb and Cu most often exceeded at small arms
- No explosives found at small arms or artillery impact areas







Range Data Summary

Artillery range

- No explosives elevated above SVs
- Metals elevated above SVs
 <20% of time
 - Surface water Cu, Pb(Sb and Zn 0%)
 - Sediment Cu, Pb, Zn(Sb 0%)

Small arms ranges

- No explosives
- Metals elevated above SVs <40% of time
 - Surface water
 - Sb and Zn <10%
 - Cu and Pb <40%
 - Sediment
 - Sb and Zn <15%
 - Cu and Pb <30%





Potential MCOC Impact

- Presence of MCOC above SV does not equate to negative effects occurring
 - bioavailability important
 - benthic macroinvertebrates used to assess stream health
- Ecological/Human health risk assessments may be completed to clarify whether a risk is present







Conclusions



- Explosives
 - not migrating from ranges at elevated levels
- Metals
 - more likely at small arms ranges at elevated levels
- Human health
 - not at unacceptable level of risk